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INDIAN ENTOMOLOGY.

Indian Insect Life; a Manual of the Insects of the Plains (Tropical India). By H. Maxwell-Lefroy, assisted by F. M. Howlett. Pp. xii+786. (Calcutta and Simla: Thacker, Spink and Co.; London: W. Thacker and Co., 1909.)

THIS handsome volume reflects great credit upon its authors, who occupy the posts of entomologists to the Imperial Department of Agriculture for India; and also upon the staff of the Agricultural Research Institute at Pusa, under the auspices of which the observations and specimens have been collected on which the present work is based.

In some prefatory remarks Mr. Maxwell-Lefroy informs us that the book is largely a product of his spare time and scanty holidays, adding that "such a volume has been so much required that he has felt that even an imperfect one was better than none." His estimate of his own work is modest—

"It may be," he says, "that a better volume will be built up on this basis, when the study of Indian entomology is further advanced. I may also emphasise the fact that where little is said, little is known, and the blanks in the book are designedly prominent to emphasise the enormous scope there is for work. I trust also that the volume may be a real stepping-stone to better things, and may help those who are advancing our knowledge of the insect life of India."

Bearing in mind the limitations thus indicated by the author himself, we cannot but congratulate him and his collaborators on the amount of useful information they have contrived to embody in their work, and on the care which has evidently been expended on its get-up and general appearance. So sumptuous indeed is the book in these latter respects that the title of "Manual" seems to be somewhat of a misnomer.

A marked feature of the book is its admirable series of illustrations. These have mostly been prepared by the artist staff of the Pusa Institute. Both the half-tone blocks and the line engravings show good workmanship; while the colour-plates, carried out by the Calcutta Phototype Company, "under very trying climatic conditions and for the first time in India," bear comparison with the best of their class. Many of the artists engaged on these illustrations are, we are informed, natives of India, trained in art schools of that country. Their work is highly creditable to all concerned.

The plan of the book is simple. It opens with an introduction of about forty pages, in which are briefly discussed the structural characters of the class Insecta, with its position in the zoological scale, the instincts and habits of insects, their classification, and the principles of nomenclature as applied to the group. The methods of identification of specimens and the existing appliances for the study of entomology in India are also noticed, and a section is devoted to a useful exposition of Indian zoogeography. The food and habitat of insects are dealt with in a practical manner, and the introduction closes with a reference

to the beneficial and other activities of insects in relation to man.

Following the introduction comes a systematic account, profusely illustrated, of each of the nine orders into which for present purposes the authors divide the class of insects. There is, of course, much divergence of opinion, and more of practice, among entomologists on the subject of classification; and the authors do wisely in warning the student against "getting to attach too much importance to any classification systems except as working conventions which have as much regard to truth as circumstances will allow." The characteristics of each order, and those of its subdivisions, are carefully given, and the most noteworthy specific forms under each head are more or less fully dealt with, sometimes, especially those of economic importance, in considerable detail. Many valuable observations on habits and life-histories are incorporated in this portion of the work, which covers the ground in as satisfactory a manner as could be expected from the limited space at the authors' disposal.

Finally, we have, somewhat after the manner of the excursions in Scudder's well-known work on the butterflies of the eastern United States, a number of brief treatises of a general kind, dealing with such subjects as cosmopolitan insects, gregarious habits, attraction to light, insects and flowers, migration, deceptive colouring with other means of protection, galls, silk, the size of insects, and insect noises. These essays, which are interspersed among the systematic sections of the book, include observations many of which are of great interest and value. As an example of a good field observation, which many travellers will be in a position to confirm, we may cite the following:—

"If one goes into a grass field, intent on observing large grasshoppers, one will suddenly see a brightly coloured insect jump up, fly a little distance and disappear. . . . The eye has followed the bright colours and loses the insect as these disappear with the closing of the wings at the completion of the flight. One's eye is not seeking the cryptically-coloured grasshopper, which thus escapes attention, even if one could easily see the motionless insect."

The modesty of the claims put forward by the authors tends to disarm criticism; nevertheless, it may perhaps be suggested that some of the topics, especially those dealt with in the introduction, might with advantage have been treated more fully. It is unfortunate, too, that the authors allow themselves to be influenced by the somewhat silly outcry that has been raised in some quarters against bionomic conclusions "drawn from museum specimens." No naturalist ought to undervalue either museum study or field observation. Each is an essential factor in unravelling the problems of evolution, and each has furnished the other with important suggestions for further research. Field work on mimicry, in especial, owes much to the stimulus afforded by the careful study of material preserved in collections.

We do not agree (p. 419) that there is much difficulty in distinguishing *Terias hecate* in all its forms from other species of *Terias*, nor that the colouring

of the upper surface of *Coletis* (or *Teracolus*) *amata* is well described as "orange." "Thaxter" on p. 405 is a misprint for Thayer. These, and a few similar slips, are but slight blemishes on a thoroughly useful book.

F. A. D.

THEORETICAL STUDIES IN RELATION TO NAUTICAL SURVEYING.

Hydrographic Surveying: Elementary—for Beginners: Seamen and Others. A Practical Handbook. By Commander Stuart V. S. C. Messum. Pp. xiv+504. (London: C. Griffin and Co., Ltd., 1910.) Price 12s. net.

THEORETICAL considerations dealing with the effect of errors of observation constitute one of the distinctive features of this book. It may be doubted whether such investigations are appropriate to a practical handbook intended for beginners; and in some instances, where they are merely of academic interest, their introduction is unnecessary. The dissertations on the manipulation of the station pointer, for example, are diffuse and of little practical utility. The chapter on the principles governing the selection of objects for fixing positions contains certain theorems which will be of interest to those already familiar with the subject; but beginners would find concise directions as to what goes to make a good fix more helpful to them. The discussions bearing on the "circle of equivalents" bring out a useful fact in a form somewhat different from that in which it has usually been presented. The principle involved is an important one, but it is possible to strain unduly its practical application. So much stress has been laid on it that beginners might easily be misled; the author himself appears to have misapplied the principle on more than one occasion.

This is notable in the example of plotting given on p. 197, where it is suggested to accept an intersection of two lines cutting each other at an angle of a little more than 30° , in preference to an intersection of about 90° . In this case primary points are alone concerned, and the considerations indicated by the author are not applicable. A similar misapprehension is noticeable on p. 201, in the paragraph relating to the projection of check lines from the best lines of reference. It is here implied that in the case of primary points, one of the lines on which they are plotted might have been laid off with a length of radius so short as to vitiate any lines laid off from it subsequently.

The question is discussed at some length as to the best zero to select for shooting up other objects when the position of the observer is not accurately determined. The problem is one of frequent occurrence, and is of great importance, but the treatment it receives is not satisfactory, and is liable to misapprehension. In this, as in some other cases, the broad practical rule of choosing a zero situated at about the same distance as the object to be shot up and making as small an angle with it as possible is not stated; whilst the investigation rests on assumptions not realisable when drifting in a boat or the ship in

an unknown direction, as always happens in practice. In the paragraph on measuring a base by chained portions, the rule of sines is used for solving triangles having one very obtuse angle and two acute angles. The proper method of solving such triangles might have suggested to the author the fact that since cosines of small angles change very slowly, small errors of observation are practically of no account, and consequently that the measurement of the off-set is unnecessary and less accurate than using each separate section of the base as measured.

Other instances of misapplication of theory to practice might be quoted, but those mentioned suffice to indicate a want of appreciation of practical requirements, and suggest the possibility that the author is more familiar with the theoretical study of the subject than with the conduct of a survey.

In discussing the question of false station, there is no reference to the simple method of eliminating all errors from that source by the expedient of observing at equal distances on opposite sides of the true station. There is, moreover, an easier method than that given by the author for calculating the correction for false station.

The use that might be made of a distant peak in connection with the angle of elevation of the mast-head when sounding a shoal has also escaped attention; neither is there any reference to the use of angles of elevation in making a running survey of an island when circumstances admit.

The investigation of the error of parallax in connection with sextant angles, due to the use of the long telescope when reflecting objects close to the observer, is of some theoretical interest, and is worthy of mention. As a matter of fact, the error from this source is not nearly so great as the author assumes, since it only exists in a minor degree with the short telescope which in practice is always used, being more convenient.

The various instruments and the methods of using them are fully described, and the ordinary operations connected with surveys of small extent are given in detail, together with a number of examples of such surveys, besides a useful chapter on amending the details of a chart.

A. M. F.

PRODUCTION OF SEED-OILS.

Linseed Oil and other Seed Oils: An Industrial Manual. By Prof. W. D. Ennis. Pp. xiv+316. (London: Constable and Co., Ltd., 1909.) Price 16s. net.

IN this work the author aims at the production of a manual which will serve as a fairly complete guide for the manufacturer of certain seed oils, more particularly linseed oil. He notes that, with one or two exceptions, the principal publications dealing with this subject hitherto have discussed it chiefly from the chemical standpoint. Accordingly in this volume the chemistry—which, after all, is relatively simple—is subordinated to the manufacturing and commercial aspects of the industry.

The work is written from the American point of